

ISM Workshop 2008

Integrating Safety Into the Design & Construction of Projects

Integrated Salt Disposition Projects at SRS



Brent Gifford
WSRC Liquid Waste Operations
HDP Deputy Facility Manager
& ISDP Project Owner

August 27, 2008



Agenda

- Mission
- ISDP Overview
- Feedback: Good Practices / Lessons
 - Integrated Project Team
 - Communication
 - Design
 - ALARA Principles
 - Subcontracts
 - Testing
 - Modifications
 - Legacy Equipment
 - Construction
 - Testing and Cold Runs
 - Command and Control
 - Readiness Reviews
- Summary



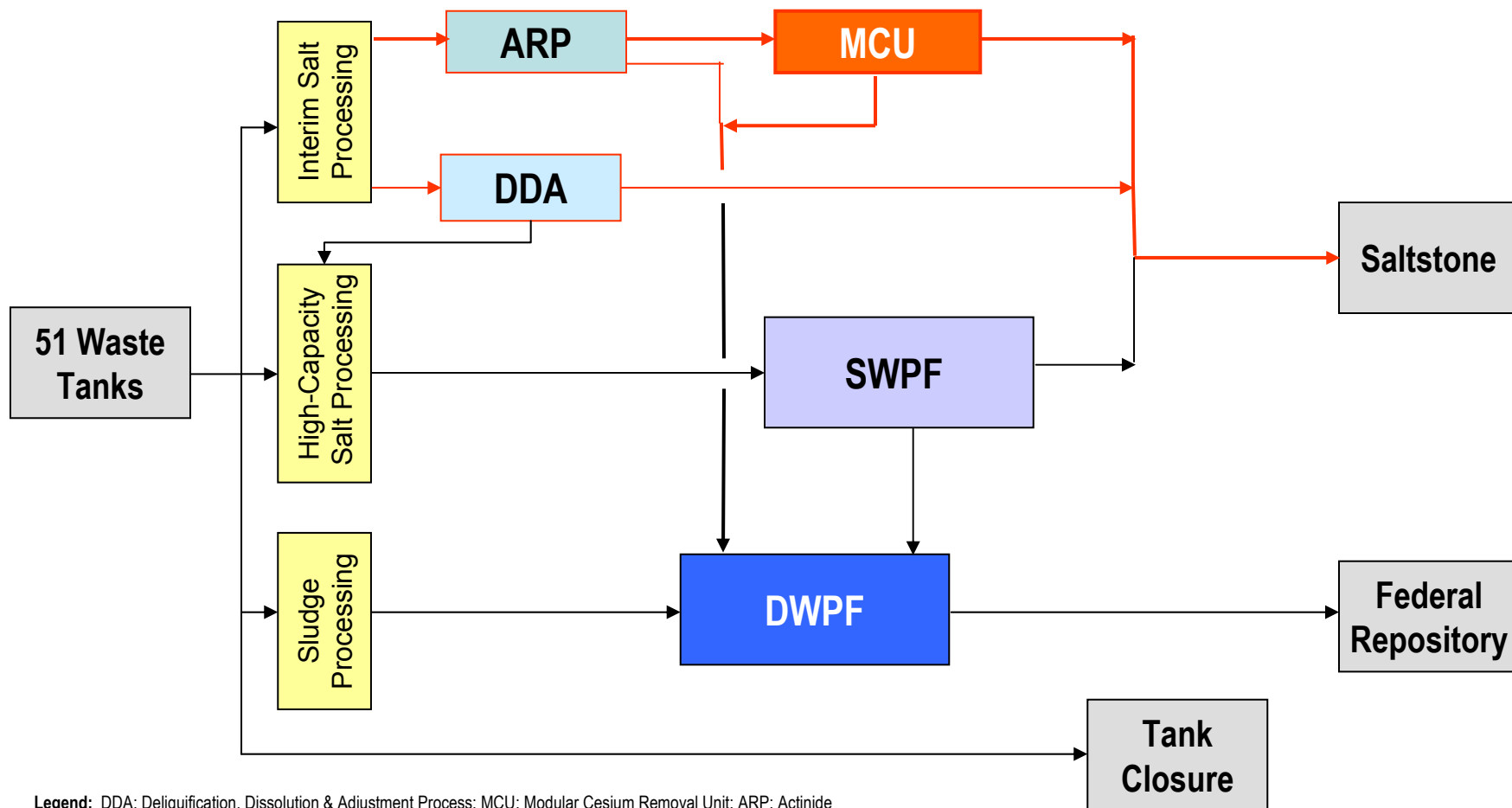
Interim Salt Disposition Project (ISDP)

Mission: Meet waste disposal objectives prior to Salt Waste Processing Facility (SWPF) operation.

HOW: Integration of:

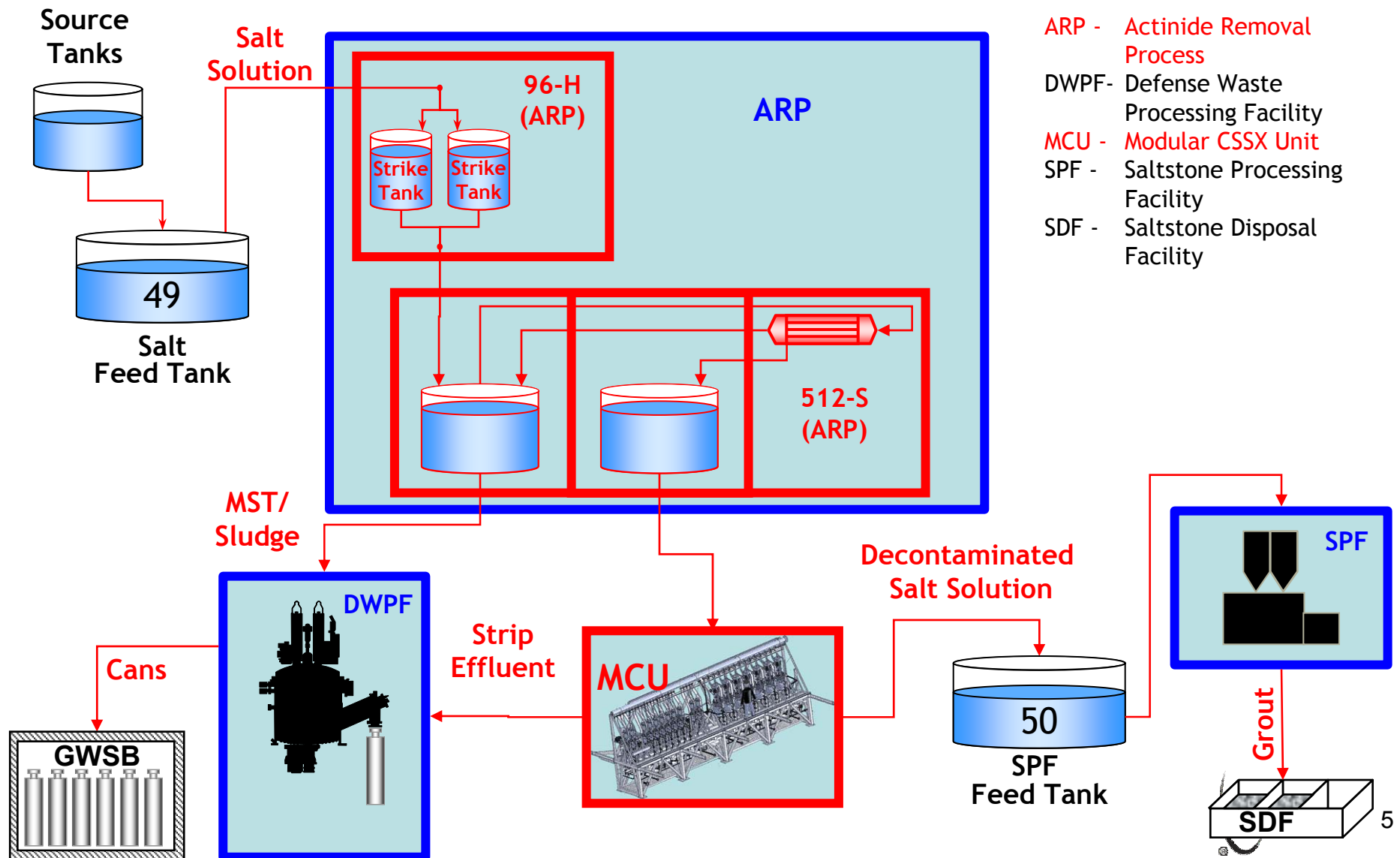
- **3 Primary Projects in 3 Facilities across 3 Safety Basis:**
 - **ARP** (Actinide Removal Process at HTF)
 - **ARP** (Actinide Filtration Process at 512-S)
 - **MCU** (Modular Caustic Side Solvent Extraction Unit at HTF)
 - **WTL** (Waste Transfer Line Project at DWPF)
- **4 Facility Infrastructure Support Projects:**
 - **CRC / Simulator** (Control Room Consolidation)
 - **SPF/SDF** (Saltstone Production/Disposal Facility)
 - **Tank 50** (Return to service modifications)
 - **DDA** (Deliquification, Dissolution and Adjustment)

ISDP Flowsheet

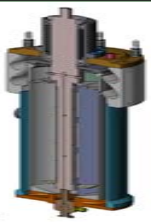


Legend: DDA: Deliquification, Dissolution & Adjustment Process; MCU: Modular Cesium Removal Unit; ARP: Actinide Removal Process; SWPF: Salt Waste Processing Facility; DWPF: Defense Waste Processing Facility;

ISDP Process Overview



Mission Timeline



**DOE Directs
New
Technology**



Site Excavation



**Site Selected
Start D&R**



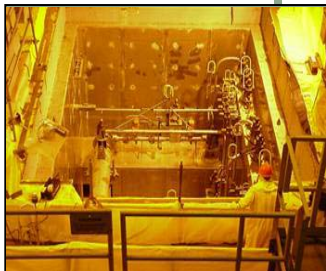
**Equipment
Fabrication / Testing**

**Jan
2004**

**Aug
2004**

**Nov / Dec
2004**

**Jan
2005**

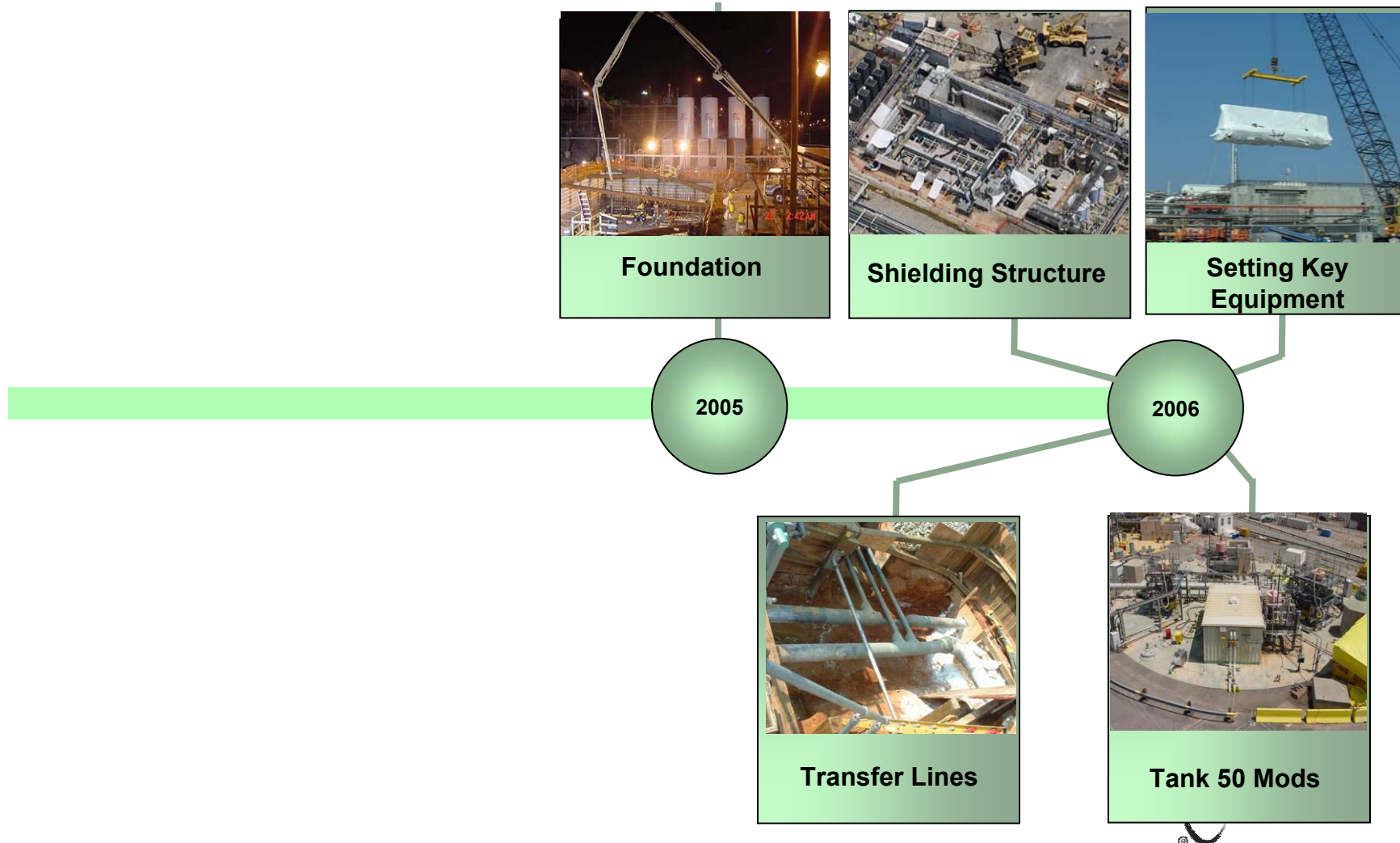


96H Cell D&R



**Saltstone Mods
Complete**

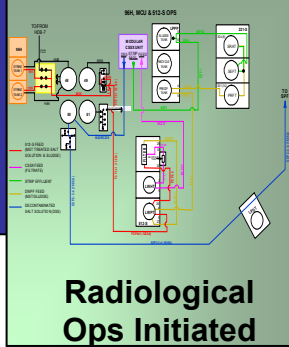
Mission Timeline



Mission Timeline



**Start Up
Complete**



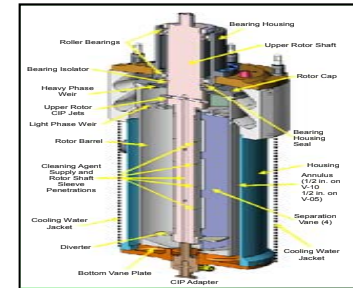
**Radiological
Ops Initiated**



**Cold Runs
Complete**



**Management Self
Assessment**



**Ready For Hot
Operations**



**Initiate Hot
Operations**

**Feb /Mar
2007**

**Jul
2007**

**Sep
2007**

**Dec
2007**

**Jan / Mar
2008**

**Mar
2008**

**Apr
2008**



**CRC / Simulator
Complete**



**Operational
Readiness
Reviews**

Project Management and Oversight

- Defined the scope and established clear expectations.
- Established clear roles, responsibilities and accountability at the start.
- Identified hazards and risk early - disciplined management (Technical, Technology, Program).
- Established firm project baselines including the readiness assessment processes and transition to operations phases.
- Placed high priority on the projects, negotiated incentive for the successful completion of interim milestones as well as integrated project completion.

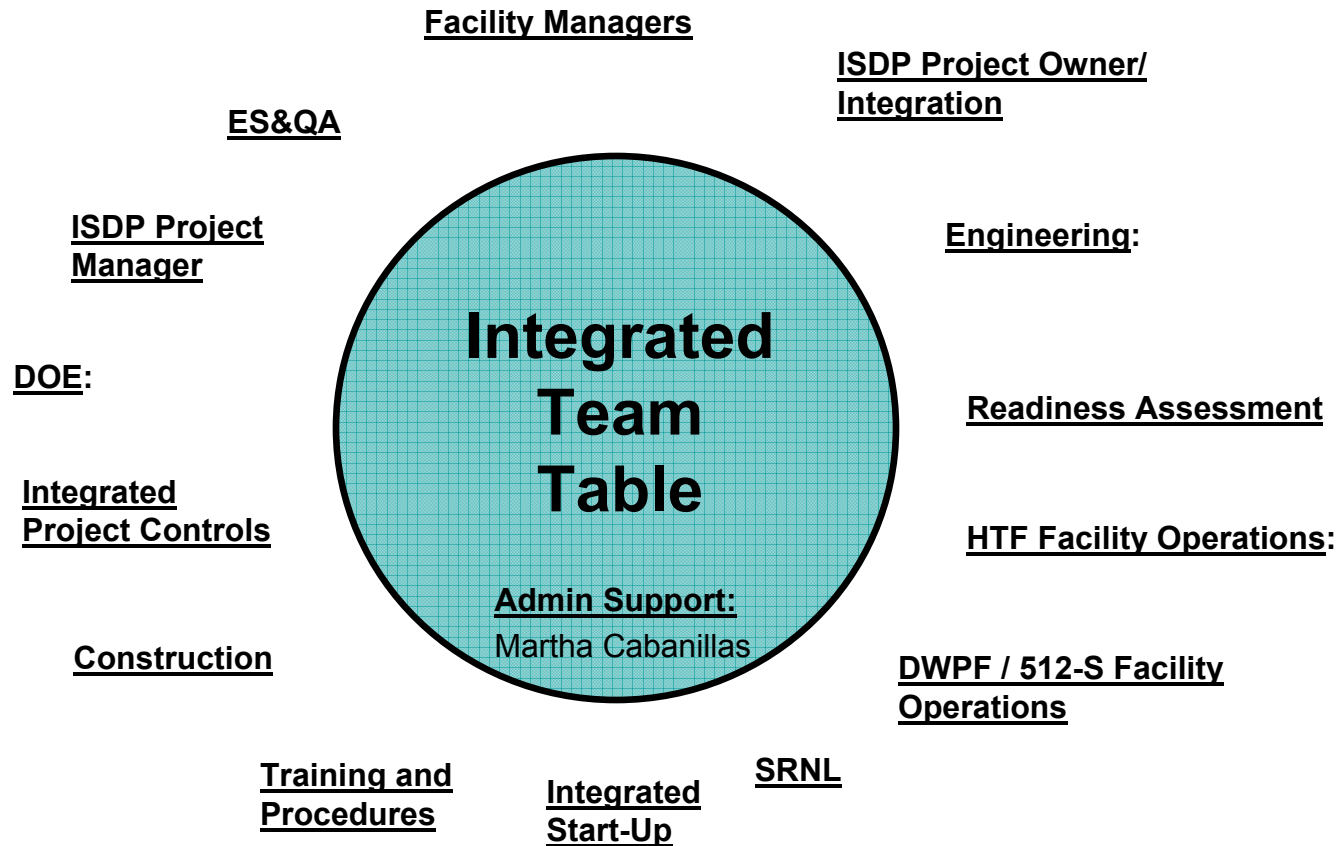
Project Management and Oversight

- Early involvement of facility personnel in projects and at subcontractors shops:
 - Safety, Engineering, Ops, RCO, Maintenance, Training, Procedures, Regulatory, etc..
- Pro-active involvement of internal/external subject matter experts (SME's) throughout all phases of the project.
- Established an Integrated Project Team including experts of the facilities/DSA's:
 - heavily involved in all project phases focused on success.
 - team encouraged to bring issues to the table and seek resolution
 - heavy emphasis on review of technical performance and verification of design attributes






















Project Management and Oversight

- Established an ISDP war room to manage start-up through hot operations activities.
- Conducted internal and independent reviews and validations at key points in the project schedule, identified and managed corrective actions to closure.
- Established a strong operations assessment program starting during the design phase.
- Established routine safety reviews, walk-downs, audits throughout all project phases.

EXAMPLE: ISDP Projectized Team Table



EXAMPLE: Risk-O-Meter

Risk Number	Includes Risks	Risk Title	Risk Level	Closed	Acceptable Risk	Minor Concern	Major Concern	Remarks
1	001C, 002C, 014C, 021C, 031C	Sub-Project delays impact ISDP	High	 ←				Risk Closed - Risk was not realized. Met M10 Milestone. MSA underway.
2	002C, 052	Integrated WAC/WCPs For ISDP Forces Changes To Facilities	High					Adverse impacts not anticipated. WACs / WCPs have been developed.
3	003C, 033C	Resource Not Available	High	 ←				Risk Closed - Risk was not realized. All funding issues have been resolved.
5	005, 005C, 044, 045, 048, 079C, 084C	Process performance does not match expectations	High					Perform bench scale test during feed batch qualification. Continue to monitor results of ongoing operations for any adverse indications.
10	010, 056	Radiological Rates and Supporting Analysis Prevent or Slow Process Operation and Equip. Maintenance	Moderate					Optimize contactor cleaning methodology as an enhancement for risk mitigation. Installed contactor cleaning modifications for future use as an enhancement or risk mitigator.
11	011C, 035, 060C	Permits / Regulatory permission not received	High					Operating permits have been received for SPF/ISDP and MCU Phase 2. Any modifications due to NRC monitoring requirements are outside ISDP scope and will be processed using a BCP.
17	017C, 024C, 030, 081C, 88, 88, 88, 87	Feed Chemistry and availability impacts ISDP	High					Monitor feed preparation plans and efforts to understand feed chemistry. Implementing strategy for adding JCO relative to residual TPB.
18	018, 050	Disposal Strategy for Spent Solvent and Equipment not Yet Finalized	High					Disposal strategy finalized. Procurement of containers initiated in FY08 for future risk mitigation.
26	026, 027, 051	Transfer Path not available / cross-contaminated	High					Analyze planned transfers to identify and resolve conflicts. Coordinate with ODA processing plans.
36	036, 039, 043C, 70C	Facility Readiness to Support ISDP	High					Infrastructure has been assessed and spare equipment needs identified. Equipment and spare parts replenishment is scheduled.
41	41	Close Coupling Between Facilities	Low					Results of CoreSIM modeling incorporated into Life-Cycle Liquid Waste Disposition System Plan (LWC-PIT-2007-06062, Revision 14).
49	049,	Mistransfer Between Process Vessels	Low	 ←				Risk Closed - Risk has been avoided. Integrated runs have addressed vulnerabilities. Standing Order 5.5.5, "Inadvertent Transfer Protocol" will be employed.
74	74C, 75	Transfer Line Segment Leakage	Low					Risk is low and existing procedures and planned evolutions provide adequate assurance that this will remain a low risk. Tank 49 valve box leak check problems corrected and additional leak tests satisfactory. M10 milestone has been met.
76	76	Reprecipitation of Material During Processing (Real Waste)	High					Perform testing at SRML and update flowsheet.
78	78	Vendor Supplies Cold Feeds with Solids	Moderate					Provide additional testing and inspection at vendors facility prior to shipment and at receiving.
82	82	MCU Solvent Charge Availability	High					Dip tube modifications complete and procurement cycle has been initiated for additional solvent charge.
83	83	Contactor Drain Valve Torque May Increase to Unacceptable Levels	High					PMs in place for cycling the Contactor Drain Valves during planned maintenance evolutions.
 Risk has been closed  Not a problem, no issues at this time  Minor concern  Major concern								Content changed since last update

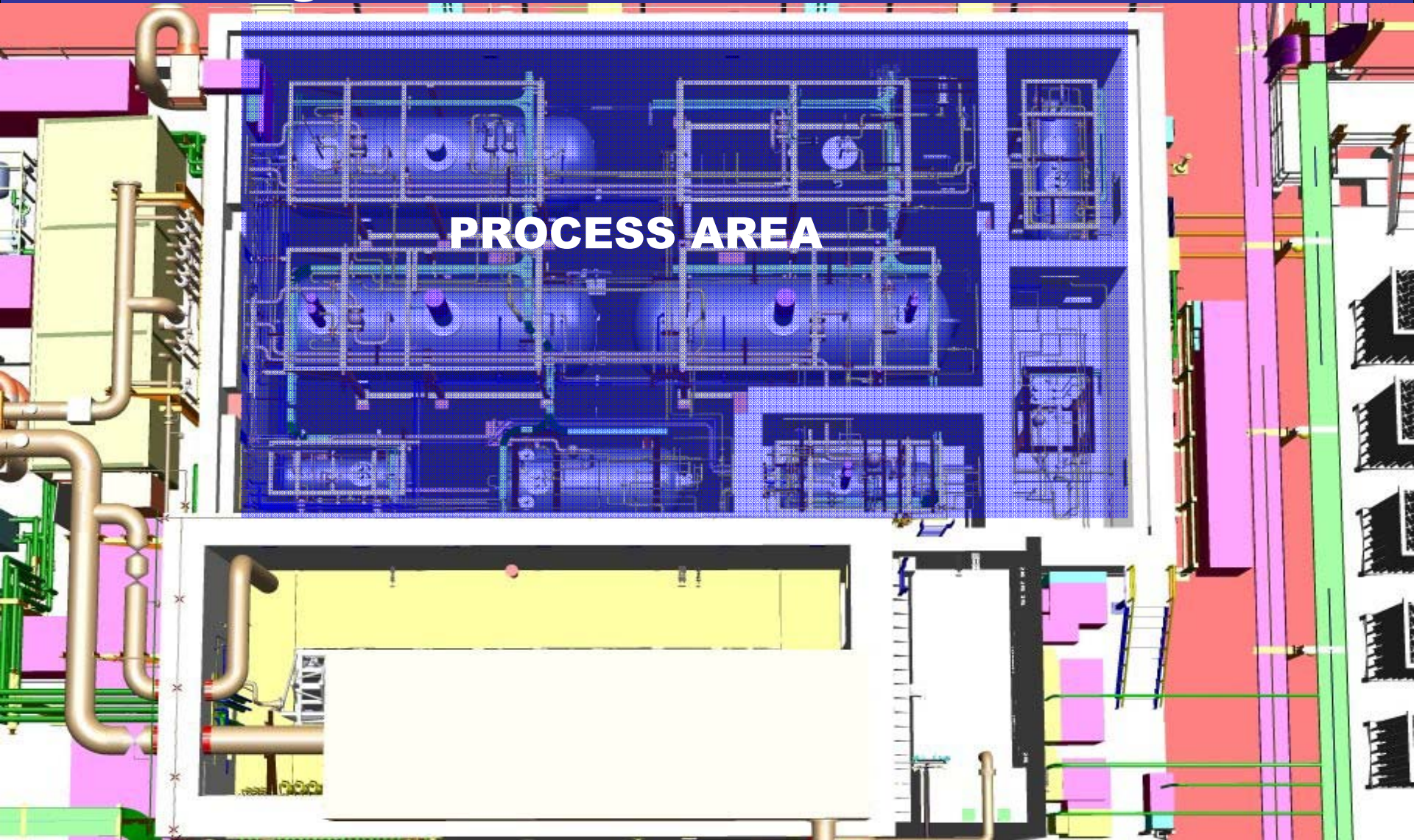
Communication

- Co-location of Project Team improves effectiveness of communication:
 - Project Owner, Project Manager, Design Authority, Design Engineering, Procurement, Construction, Safety, RCO, QA, Project Controls
 - Supports prompt response and resolution of emergent issues
- Fast Track Project:
 - Integrated Project Schedule Aligned to Provide:
 - Critical Tank Space for HTF Operations
 - Support SWPF Start Up
 - Support ongoing facility operations
 - Parallel Work Efforts
 - Provide Opportunity for Schedule Acceleration
 - Focus on “end in mind” (encouraged early team interaction)
 - Mature issue resolution (real time with external resources)

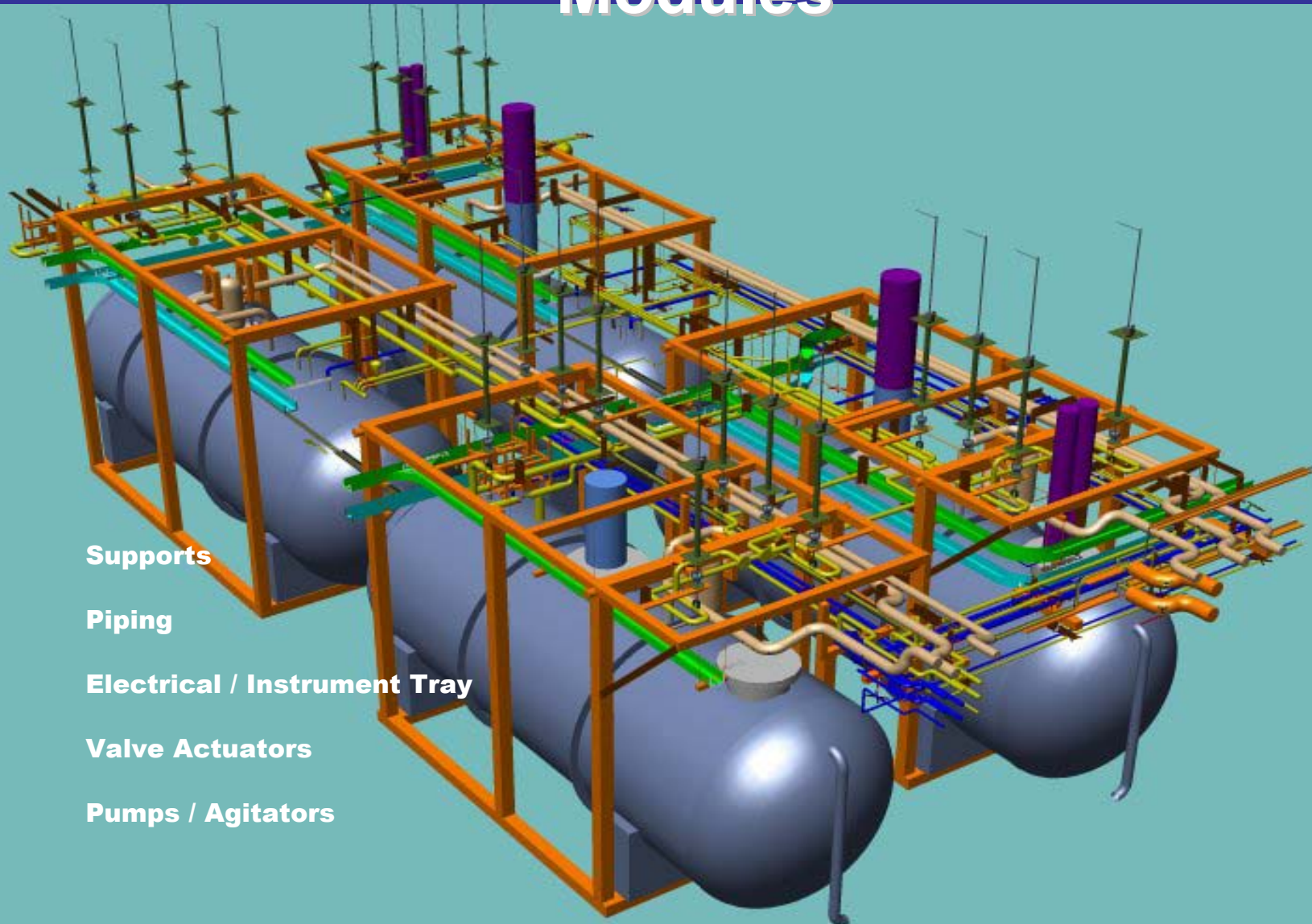
Design

- Utilized lessons learned extensively.
- Placed strong focus on Safety and ALARA principles.
- Integrated site forces (Maintenance, Operators, RCO, IH Procedures, Training etc..) early.
- Conducted “Constructability Reviews” starting in design phase.
- Conducted bi-weekly Design Authority/Engineering & Construction Interface Meetings:
 - Discuss and resolve issues
 - Shortened design review & comment incorporation time
- Extensive use of 3D model from design development into the operational phase:
 - Improved safety and ALARA throughout design, construction, readiness, operations, maintenance.
 - Reduced risks

Design with 3D Automation Tools



Assembling, Testing, Installation of Modules



Supports

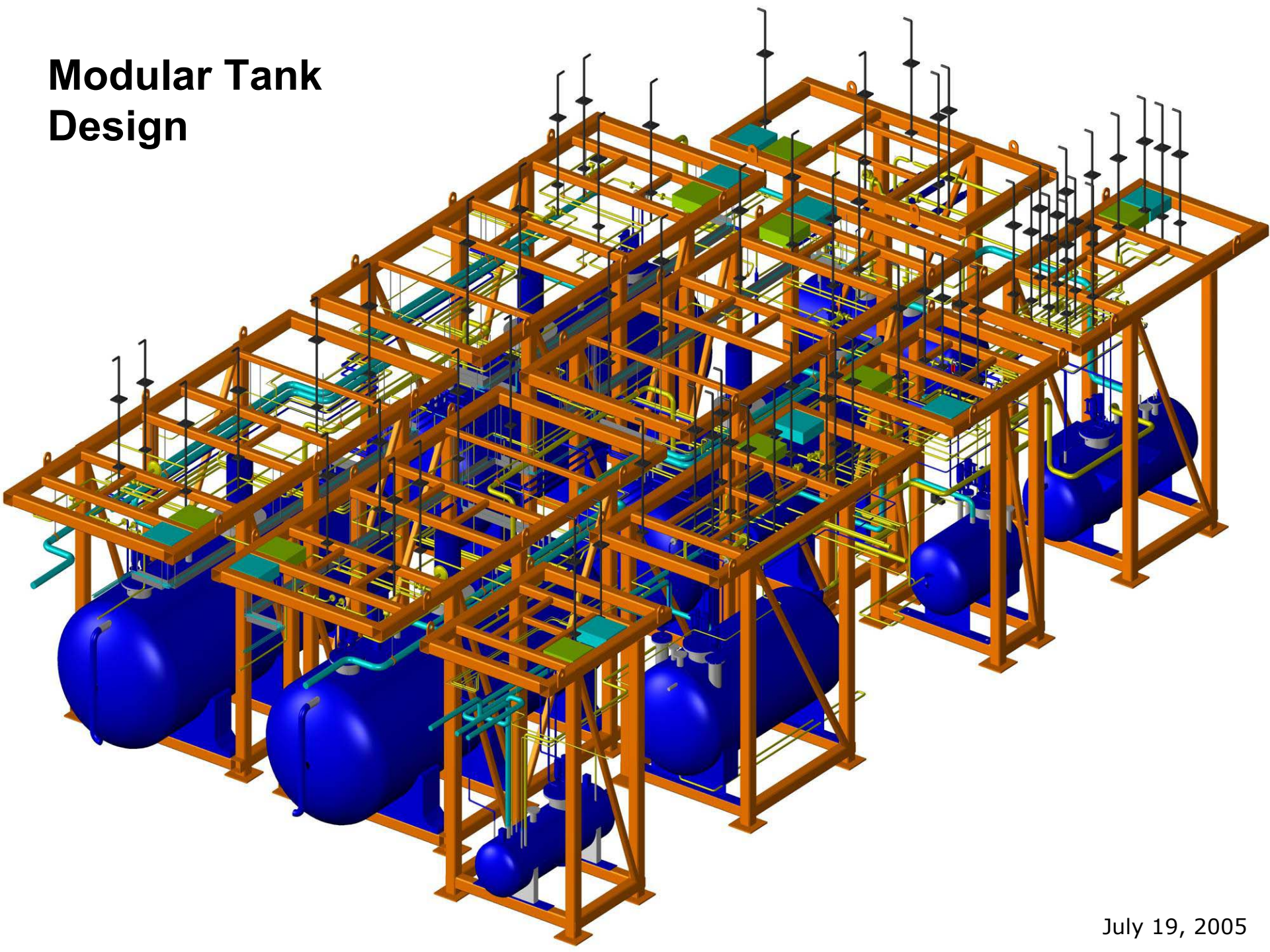
Piping

Electrical / Instrument Tray

Valve Actuators

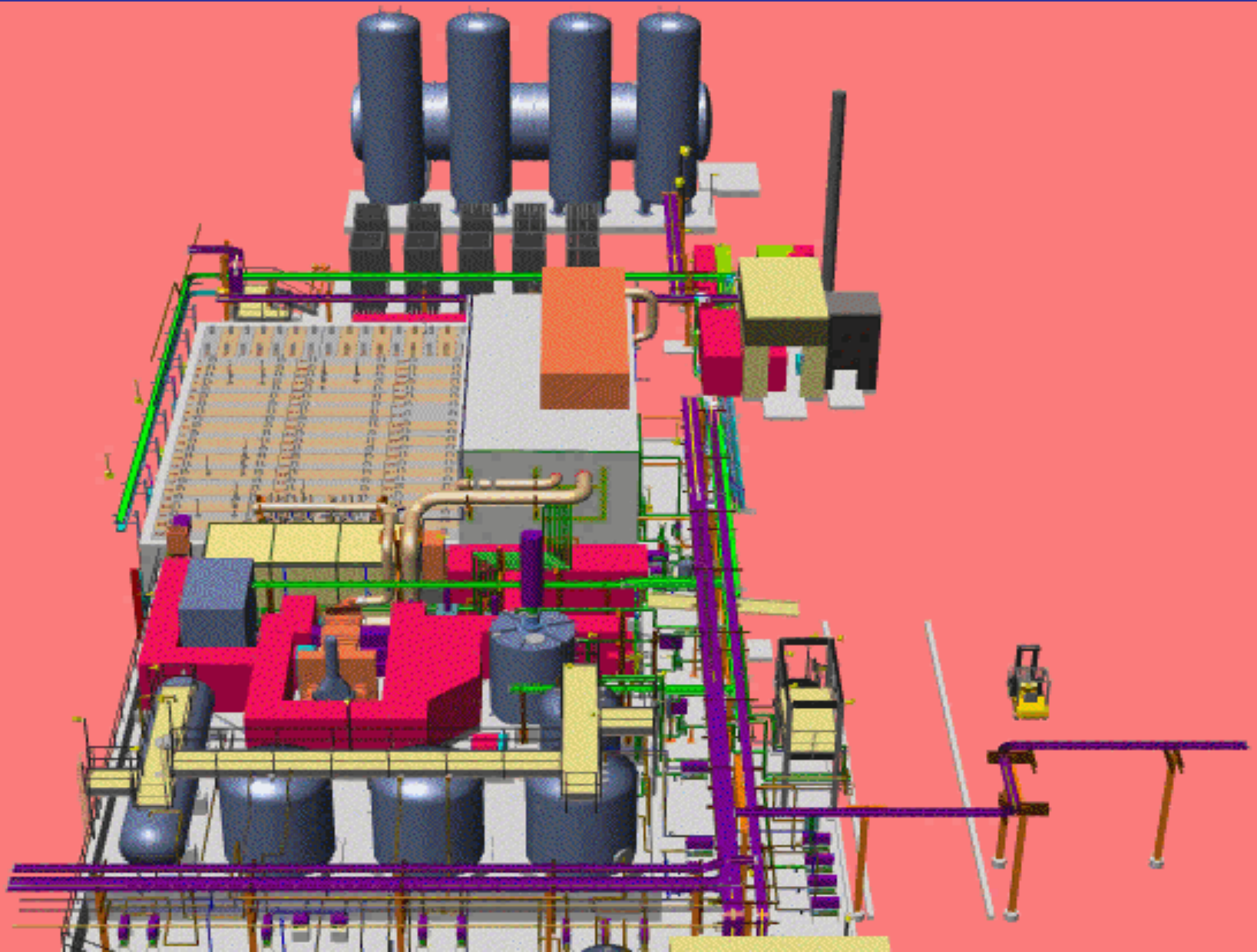
Pumps / Agitators

Modular Tank Design



July 19, 2005

Animated Modeling



Designed with Safety / ALARA Focus

- Segregated tanks and sumps by source term.
- Minimized in cell maintenance.
- Utilized natural shielding.
- Evaluated material / equipment for reliability
 - Utilize manual valves
- Eliminated flanged connections.
- Minimized process holdup (tank sumps, slope lines, internal flush systems, gravity as motive force for contractors).
- Minimized ventilation interaction (flapper valves).

Designed with Safety / ALARA Focus

- Provided redundant pumps to de-inventory the process vessels.
- Provided camera ports to facilitate evaluations.
- Provided process recycle capability to reduce pre-maintenance radiation dose levels.
- Provided contactor (Clean-In-Place) chemical flush capability to reduce dose to support maintenance if required.
- Provided ventilation system design to:
 - Minimize contamination transfer through high intake and low cell exhaust
 - Redirect airflow to maximize linear face velocity at an cell opening
- Radiological Design Summary Report (RDSR) used to confirm design and controls.

Improved Safety Through Use of Subcontracts

- Segregated work to those with experience.
- Enabled work activities to be performed in parallel.
- Provided early identification of safety and process issues.
- Reduced on-site risks, schedule, costs, safety and co-occupancy issues.
- Example 1: Decanter Design/Construction
 - Contracted to ABW Technologies
 - Specialized in Fabrication
 - Design by ARES Corporation
 - Previous Decanter Design
 - Extensive Modeling
- Example 2: Contactor Assembly Design/Construction/Testing
 - Contracted to Wright Industries, Incorporated (WII)
 - Specialized in Fabrication
 - Supported testing of technical performance requirements
 - Costner Industries Nevada Corporation (CINC)
 - Modified Design to Meet Current Customer Requirements

EXAMPLE: Testing of Contactor Assembly

- Maintained full time project personnel presence and STR at major subcontractors facilities from design through delivery:
- Individual V-10 & V-05 Testing
 - Hydraulics, Air Flow
 - Mass Transfer, Solvent Carry Over
- Integrated Testing
 - Durability testing
 - Mass transfer
 - Solvent carryover
- Decanter Testing
 - Solvent Carryover
 - Solvent Droplet Distribution
 - Pump required for coalescer



EXAMPLE: Testing of Contactor Assembly

- Testing at subcontractors shop lead to design changes prior to receiving on site.
- Reduced process risks, future maintenance, potential radiological exposure and improved process performance:
 - Modified the Contactor Bearing Seal Design
 - Reduced potential for pre-mature bearing failure
 - Modified Contactor housing configuration
 - Reduced axial movement and potential for pre-mature failures
 - Changed vane diameter for the V-05 contactor.
 - optimized process performance - air flow through the unit.



+/- Of Legacy Equipment & Reuse

- D&R Phase Interferences
 - Abandoned in place de-energized electrical duct bank and construction roadway
- Scrub Feed Tank
 - ScFT was salvaged from F-Canyon cold feeds area
 - Ensure cleanliness & consider chemistry impacts
 - Thoroughly documented inspections
- Shielded Sampler Box
 - Utilized H-Canyon sample box
 - Cost & schedule savings
- Strip Feed Tank
 - ITP Cold Feeds area tank reused without issue
 - Cost & schedule savings



Construction with Focus on Safety

- Utilized “Greenfield” Construction Approach within operating facility:
 - Isolated the hazards
- Maximized pre-assembly of Equipment:
 - Improved safety and quality posture.
 - Enabled fabrication to be performed in a tightly controlled environment vs confined space
 - Enabled field work to be performed in parallel
 - Shortened operating facility impacts/outages/risks



Scheduled high risk activities for optimum work periods





3/06

Managed Hazards with Temporary Confinement



Containment Coating System

Construction with Focus on Safety

- Mature Hazards Analysis Process
- Performed routine daily, weekly, monthly facility/project team safety walk-downs/audits.
- Scheduled routine safety inspections
- Project meetings and training promote involvement, analysis and accountability to safety throughout all levels of the team.
- Safety reviews are part of pre-job briefs.
- Utilized “Safety Task Assignment Risk Reduction Talks”. (STARRT Cards)
- Effective implementation of “Time-Out” programs.



Testing, Cold Runs, Simulant Runs

- Established a “War-Room” - manage start-up testing through Operations activities.
- Incorporated operations procedures into the start-up test plans for early validation/proficiency.
- Utilized a auxiliary (local) control room and assigned Operators to support start-up (S/U) testing:
 - Early hands on training
 - Reduced facility impacts during S/U testing
 - Supported real time communications/walk-downs in the field
- Developed a Process simulator - provided platform to support process and procedure rework.
- Documented as built configuration with IPX photography-Virtual Tour Technology,
- Validated process and equipment performance test results from the sub-contractors facilities.

War Room Purpose:

- ➡ Provide focused resources and oversight to clearly define and **SAFELY** accomplish a given task
- ➡ Develop an effective forum for managing the critical path
- ➡ Provide resources and priority to eliminate barriers and restraints
- ➡ Ensure hazards analysis, controls and task readiness for safe scope execution
- ➡ Provide early detection, prompt communication and expeditious resolution of emergent issues
- ➡ Expedite safe field execution through work closure and operational acceptance.
- ➡ Provide real time feedback for upcoming scopes of work,

War Room Expectations :

ISDP PROJECT OWNER / TEAM LEAD: Brent Gifford

OPERATIONS MANAGER: Glen Johnson

WAR ROOM MANAGER: Jonathan Mills

- ◆ **Safety First** –Integrate Safety into ALL aspects of the job, respond with the highest priority.
- ◆ **Manage integrated schedule performance** – execute work as scheduled unless approved by the War Room Manager
- ◆ **Update the posted War Room Master Schedule and Critical Path** at minimum once per shift and review as part of during shift turnover process.
- ◆ **Problems involving the implementation/integration of work** shall be brought to the attention of the War Room Manager.
- ◆ Work groups who **anticipate** or experience **>1 hour delay** to the critical path activities shall **notify the War Room Manager** and **>2 hour delay** the **Ops Manager** and **Project Owner**.
- ◆ **Changes** to War Room schedules and scope shall be approved by the War Room Manager with concurrence from the Operations Manager & Project Owner.
- ◆ **War Room Manager will status the Project Owner** at 0630 and 1500 hrs unless other arrangements are approved by the Project Owner.

Command and Control

- Staffing established early using time motion study
- Facility skilled staff used by implementing control room consolidation
- Central control room provided improved communications and management for integrated demonstration runs and operations.
- Simulator provided platform for procedure validation and proficiency
- Established a Management Control Plan (MCP) for a disciplined transition to hot operations



Readiness Reviews Help To Ensure ISDP Safe to Operate

- Formal Project Design Reviews
- Independent Technical/SME Reviews
- Senior Management Reviews
- Company Functional Management Reviews
- Facility Evaluation Board – Project Review Team (FEB-PRT) Assessments
- DOE-SR validations (independent and internal)
- Facility FEB Assessments
- DNFSB Reviews
- Facility Self Assessment
- Management Self Assessment
- WSRC-Operational Readiness Review (ORR)
- DOE-ORR

- Pre-hot operations activities included:
 - > 600 hours of proficiency operations among 4 shifts
 - ~ 500 transfers in the simulator
 - ~ 50 integrated transfers between facilities (excluding internal transfers)

Management Control Plan (MCP)

- MCP defines the management oversight expectations & controls to be used to ensure safe and effective start-up and operation
- Establishes requirements and boundaries of activities to be performed
- Begins with authorization to proceed with hot operations (AA) through release to normal operations
- Emphasis on 5 strategic areas:
 - Equipment operability, Operator knowledge & performance, Procedure viability, Management oversight, Final management review & authorization

1st Three Months Under the MCP

Confirm Safe ISDP Operations

- Validated safe process performance with real waste:
 - Meeting/exceeding process expectations:
DF, CF, Solvent performance, solvent carryover
 - Successful RCO / IH validations
 - Supporting the LW salt disposition strategy
- Validating procedures, building operational proficiency and experience with real waste.
- Establishing basis for further operational optimization and future improvements.
- Providing lessons learned for SWPF

Challenges

- First of a Kind Process
- Accelerated Schedule
- Co-occupancy issues
- Projects integrated into multiple operating radiological facilities
- Plant infrastructure
 - Requires investment due to age of facilities
 - Relies on mature process planning and risk management focused to avoid program impacts
- Performing Demolition and Removal (D&R) work in an area where as-built information was incomplete.
- 70% of work in a confined area 20 feet below grade.

ISDP Results:

- Fast Track Project Operating Using “First-Of-A-Kind” New Technology:
 - Design/Build Completed in 28 months
 - Construction completed 4 months ahead of schedule
 - Key Project Milestones completed on/ahead of schedule
 - Safely completed the project scope \$26M under budget
- Excellent Safety Performance: 0 project lost work day cases and only 3 first aid cases.
- Successfully completed an FSA, MSA, Contractor ORR.
- Completed a DOE ORR with independent SME oversight with only 1 pre-start finding.
- Safely operated the process through hundreds of hours of operations – no safety issues, while meeting/exceeding design basis requirements.

ISDP Summary

- Maintain Safety Priority and Focus Throughout all Phases of a Project:
 - Operate with Safety as Priority, “Assess to Operate, Test to Assess, Build to Test, Design to Build”
- Co-Location of Project Team is an Effective Communication Tool on a “Fast Track” Project.
- Include Early Involvement of Facility Personnel and SME’s.
- Use Caution When a Vendor Tells You Something - Test, Test, Test.
- Re-Use of Existing Equipment Requires Thoroughly Documented Inspections/Testing – Expect the Unexpected.
- Consider Process Upsets for Instrumentation Design.
- Early-Time Motion Study Supports Efficient Staffing.
- Simulator Provides Increased Proficiency and Testing Benefits.
- Integration of Critical Groups (e.g. operations and procedures) with Testing Provides Early Identification of Issues.
- Working Activities in Parallel Can Accelerate Schedule - Recognize There are Costs/Schedule Risks if Rework Becomes Necessary.

Backup Slides

MCU Before



7/04

Status of ARP



96-H Building

Status of ARP



Cells

Status of MCU

